

WHAT IS CLAIMED IS:

1. A method for determining a head position of a driver of a vehicle, the vehicle comprising at least one rearview mirror, the method comprising:

detecting an inclination angle of the at least one rearview mirror in a coordinate system comprising horizontal and vertical components; and

calculating a range of the head position of the vehicle driver on the basis of the inclination angle.

2. A method for determining a head position of a driver of a vehicle, the vehicle comprising a left rearview mirror and a right rearview mirror, the method comprising:

detecting a first horizontal angle  $\theta_L$ , the first horizontal angle being an inclination angle of the left rearview mirror in a horizontal direction;

calculating, on the basis of the first horizontal angle  $\theta_L$ , a first horizontal angle range of the head position with respect to the left rearview mirror;

detecting a second horizontal angle  $\theta_R$ , the second horizontal angle being an inclination angle of the right rearview mirror in the horizontal direction; and

calculating, on the basis of the second horizontal angle  $\theta_R$ , a second horizontal angle range of the head position with respect to the right rearview mirror.

3. The method of claim 2, further comprising selecting values for a set of predetermined angles, the predetermined angles consisting of  $\Delta\theta_L$  and  $\Delta\theta_R$ ,

wherein the first horizontal angle range comprises, toward a vehicle body from the rearward direction of the vehicle body, a range of about  $2\theta_L - \Delta\theta_L$  to about  $2\theta_L + \Delta\theta_L$ ; and

the second horizontal angle range comprises, toward a vehicle body from the rearward direction of the vehicle body, a range of about  $2\theta_R - \Delta\theta_R$  to about  $2\theta_R + \Delta\theta_R$ .

4. The method of claim 3, wherein a horizontal distance  $r$  measured between the vehicle body and a center of the rearview mirror and a horizontal distance  $l$  measured between a rear end of the vehicle body and a center of the rearview mirror, satisfies first and second equations, the first equation consisting of  $\Delta\theta_R = \tan^{-1}(r/l)$ , and the second equation consisting of  $\Delta\theta_L = \tan^{-1}(r/l)$ .

5. The method of claim 2, further comprising:

detecting a first vertical angle  $\phi_L$ , the first vertical angle being an inclination angle of the left rearview mirror in a vertical direction;

calculating, on the basis of the first vertical angle  $\phi_L$ , a first vertical angle range of the head position with respect to the left rearview mirror;

detecting a second vertical angle  $\phi_R$ , the second vertical angle being an inclination angle of the right rearview mirror in a vertical direction; and

calculating, on the basis of the second vertical angle  $\phi_R$ , a second vertical angle range of the head position with respect to the right rearview mirror.

6. The method of claim 3, further comprising:

detecting a first vertical angle  $\phi_L$ , the first vertical angle being an inclination angle of the left rearview mirror in a vertical direction;

calculating, on the basis of the first vertical angle  $\phi_L$ , a first vertical angle range of the head position with respect to the left rearview mirror;

detecting a second vertical angle  $\phi_R$ , the second vertical angle being an inclination angle of the right rearview mirror in a vertical direction; and

calculating, on the basis of the second vertical angle  $\phi_R$ , a second vertical angle range of the head position with respect to the right rearview mirror.

7. The method of claim 4, further comprising:

detecting a first vertical angle  $\phi_L$ , the first vertical angle being an inclination angle of the left rearview mirror in a vertical direction;

5 calculating, on the basis of the first vertical angle  $\phi_L$ , a first vertical angle range of the head position with respect to the left rearview mirror;

detecting a second vertical angle  $\phi_R$ , the second vertical angle being an inclination angle of the right rearview mirror in a vertical direction; and

10 calculating, on the basis of the second vertical angle  $\phi_R$ , a second vertical angle range of the head position with respect to the right rearview mirror.

8. The method of claim 5, further comprising selecting values for a set of predetermined angles, the predetermined angles consisting of  $\Delta\phi_{L1}$ ,  $\Delta\phi_{L2}$ ,  $\Delta\phi_{R1}$ , and  $\Delta\phi_{R2}$ ,

15 wherein the first vertical angle range comprises, upward from a horizontal plane of a vehicle body, a range of  $\phi_L + \Delta\phi_{L1}$  to  $\phi_L + \Delta\phi_{L2}$ ; and

the second vertical angle range comprises, upward from the horizontal plane of the vehicle body, a range of  $\phi_R + \Delta\phi_{R1}$  to  $\phi_R + \Delta\phi_{R2}$ .

20 9. The method of claim 6, further comprising selecting values for a set of predetermined angles, the predetermined angles consisting of  $\Delta\phi_{L1}$ ,  $\Delta\phi_{L2}$ ,  $\Delta\phi_{R1}$ , and  $\Delta\phi_{R2}$ ,

wherein the first vertical angle range comprises, upward from a horizontal plane of a vehicle body, a range of  $\phi_L + \Delta\phi_{L1}$  to  $\phi_L + \Delta\phi_{L2}$ ; and

25 the second vertical angle range comprises, upward from the horizontal plane of the vehicle body, a range of  $\phi_R + \Delta\phi_{R1}$  to  $\phi_R + \Delta\phi_{R2}$ .

10. The method of claim 7, further comprising selecting values for a set of

predetermined angles, the predetermined angles consisting of  $\Delta\phi_{L1}$ ,  $\Delta\phi_{L2}$ ,  $\Delta\phi_{R1}$ , and  $\Delta\phi_{R2}$ ,

wherein the first vertical angle range comprises, upward from a horizontal plane of a vehicle body, a range of  $\phi_L + \Delta\phi_{L1}$  to  $\phi_L + \Delta\phi_{L2}$ ; and

the second vertical angle range comprises, upward from the horizontal plane of the vehicle body, a range of  $\phi_R + \Delta\phi_{R1}$  to  $\phi_R + \Delta\phi_{R2}$ .

11. A method for determining a head position of a driver of a vehicle, the vehicle comprising a left rearview mirror and a right rearview mirror, the method comprising:

detecting a first vertical angle  $\phi_L$ , the first vertical angle being an inclination angle of the left rearview mirror in a vertical direction;

calculating, on the basis of the first vertical angle  $\phi_L$ , a first vertical angle range of the head position with respect to the left rearview mirror;

detecting a second vertical angle  $\phi_R$ , the second vertical angle being an inclination angle of the right rearview mirror in a vertical direction; and

calculating, on the basis of the second vertical angle  $\phi_R$ , a second vertical angle range of the head position with respect to the right rearview mirror.

12. The method of claim 11, further comprising selecting values for a set of predetermined angles, the predetermined angles consisting of  $\Delta\phi_{L1}$ ,  $\Delta\phi_{L2}$ ,  $\Delta\phi_{R1}$ , and  $\Delta\phi_{R2}$ ,

wherein the first vertical angle range comprises, upward from a horizontal plane of a vehicle body, a range of  $\phi_L + \Delta\phi_{L1}$  to  $\phi_L + \Delta\phi_{L2}$ ; and

the second vertical angle range comprises, upward from the horizontal plane of the vehicle body, a range of  $\phi_R + \Delta\phi_{R1}$  to  $\phi_R + \Delta\phi_{R2}$ .

13. An apparatus for determining a head position of a driver of a vehicle, the vehicle comprising a left rearview mirror and a right rearview mirror, the apparatus comprising:

5 a first horizontal angle detector for detecting a first horizontal angle  $\theta_L$ , the first horizontal angle being an inclination angle of the left rearview mirror in a horizontal direction;

a second horizontal angle detector for detecting a second horizontal angle  $\theta_R$ , the second horizontal angle being an inclination angle of the right rearview mirror in the horizontal direction; and

10 an electronic control unit for calculating the head position of the driver on the basis of the first and second horizontal angles  $\theta_L$  and  $\theta_R$  that are detected at the first and second horizontal angle detectors respectively,

wherein the electronic control unit at least performs:

15 detecting the first horizontal angle  $\theta_L$ ;

calculating, on the basis of the first horizontal angle  $\theta_L$ , a first horizontal angle range of the head position with respect to the left rearview mirror;

detecting the second horizontal angle  $\theta_R$ ; and

20 calculating, on the basis of the second horizontal angle  $\theta_R$ , a second horizontal angle range of the head position with respect to the right rearview mirror.

14. The apparatus of claim 13, further comprising selecting values for a set of predetermined angles, the predetermined angles consisting of  $\Delta\theta_L$  and  $\Delta\theta_R$ ,

25 wherein the first horizontal angle range comprises, toward a vehicle body from the rearward direction of the vehicle body, a range of  $2\theta_L - \Delta\theta_L$  to  $2\theta_L + \Delta\theta_L$ ; and

the second horizontal angle range comprises, toward a vehicle body from the

rearward direction of the vehicle body, a range of  $2\theta_R - \Delta\theta_R$  to  $2\theta_R + \Delta\theta_R$ .

15. The apparatus of claim 14, wherein, a horizontal distance  $r$  measured between the vehicle body and a center of the rearview mirror and a horizontal distance  $l$  measured between an end of the vehicle body and a center of the rearview mirror satisfies first and second equations, the first equation consisting of  $\Delta\theta_R = \tan^{-1}(r/l)$ , and the second equation consisting of  $\Delta\theta_L = \tan^{-1}(r/l)$ .

16. The apparatus of claim 13, further comprising

a first vertical angle detector for detecting a first vertical angle  $\phi_L$ , the first vertical angle being an inclination angle of the left rearview mirror in a vertical direction; and

a second vertical angle detector for detecting a second vertical angle  $\phi_R$ , the second vertical angle being an inclination angle of the right rearview mirror in a vertical direction,

wherein the electronic unit further performs:

detecting the first vertical angle  $\phi_L$ ;

calculating, on the basis of the first vertical angle  $\phi_L$ , a first vertical angle range of the head position with respect to the left rearview mirror;

detecting the second vertical angle  $\phi_R$ ; and

calculating, on the basis of the second vertical angle  $\phi_R$ , a second vertical angle range of the head position with respect to the right rearview mirror.

17. The apparatus of claim 14, further comprising

a first vertical angle detector for detecting a first vertical angle  $\phi_L$ , the first vertical angle being an inclination angle of the left rearview mirror in a vertical direction; and

a second vertical angle detector for detecting a second vertical angle  $\phi_R$ , the

second vertical angle being an inclination angle of the right rearview mirror in a vertical direction,

wherein the electronic unit further performs:

detecting the first vertical angle  $\phi_L$ ;

5 calculating, on the basis of the first vertical angle  $\phi_L$ , a first vertical angle range of the head position with respect to the left rearview mirror;

detecting the second vertical angle  $\phi_R$ ; and

calculating, on the basis of the second vertical angle  $\phi_R$ , a second vertical angle range of the head position with respect to the right rearview mirror.

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18. The apparatus of claim 15, further comprising

a first vertical angle detector for detecting a first vertical angle  $\phi_L$ , the first vertical angle being an inclination angle of the left rearview mirror in a vertical direction; and

15 a second vertical angle detector for detecting a second vertical angle  $\phi_R$ , the second vertical angle being an inclination angle of the right rearview mirror in a vertical direction,

wherein the electronic unit further performs:

detecting the first vertical angle  $\phi_L$ ;

20 calculating, on the basis of the first vertical angle  $\phi_L$ , a first vertical angle range of the head position with respect to the left rearview mirror;

detecting the second vertical angle  $\phi_R$ ; and

calculating, on the basis of the second vertical angle  $\phi_R$ , a second vertical angle range of the head position with respect to the right rearview mirror.

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19. The apparatus of claim 16, further comprising selecting values for a set of predetermined angles, the predetermined angles consisting of  $\Delta\phi_{L1}$ ,  $\Delta\phi_{L2}$ ,  $\Delta\phi_{R1}$ , and  $\Delta\phi_{R2}$ ,

wherein the first vertical angle range comprises, upward from a horizontal plane of a vehicle body, a range of  $\phi_L + \Delta\phi_{L1}$  to  $\phi_L + \Delta\phi_{L2}$ ; and

the second vertical angle range comprises, upward from the horizontal plane of the vehicle body, a range of  $\phi_R + \Delta\phi_{R1}$  to  $\phi_R + \Delta\phi_{R2}$ .

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20. The apparatus of claim 17, further comprising selecting values for a set of predetermined angles, the predetermined angles consisting of  $\Delta\phi_{L1}$ ,  $\Delta\phi_{L2}$ ,  $\Delta\phi_{R1}$ , and  $\Delta\phi_{R2}$ ,

10 wherein the first vertical angle range comprises, upward from a horizontal plane of a vehicle body, a range of  $\phi_L + \Delta\phi_{L1}$  to  $\phi_L + \Delta\phi_{L2}$ ; and

the second vertical angle range comprises, upward from the horizontal plane of the vehicle body, a range of  $\phi_R + \Delta\phi_{R1}$  to  $\phi_R + \Delta\phi_{R2}$ .

15 21. The apparatus of claim 18, further comprising selecting values for a set of predetermined angles, the predetermined angles consisting of  $\Delta\phi_{L1}$ ,  $\Delta\phi_{L2}$ ,  $\Delta\phi_{R1}$ , and  $\Delta\phi_{R2}$ ,

wherein the first vertical angle range comprises, upward from a horizontal plane of a vehicle body, a range of  $\phi_L + \Delta\phi_{L1}$  to  $\phi_L + \Delta\phi_{L2}$ ; and

20 the second vertical angle range comprises, upward from the horizontal plane of the vehicle body, a range of  $\phi_R + \Delta\phi_{R1}$  to  $\phi_R + \Delta\phi_{R2}$ .

22. An apparatus for determining a head position of a driver of a vehicle, the vehicle comprising a left rearview mirror and a right rearview mirror, the apparatus comprising:

25 a first vertical angle detector for detecting a first vertical angle  $\phi_L$ , the first vertical angle being an inclination angle of the left rearview mirror in a vertical direction;

a second vertical angle detector for detecting a second vertical angle  $\phi_R$ , the



second vertical angle being an inclination angle of the right rearview mirror in a vertical direction; and

an electronic control unit for calculating the head position of the driver on the basis of the first and second vertical angles  $\phi_L$  and  $\phi_R$  that are detected at the first and second vertical angle detectors respectively,

wherein the electronic control unit at least performs:

detecting a first vertical angle  $\phi_L$ , the first vertical angle being an inclination angle of the left rearview mirror in a vertical direction;

calculating, on the basis of the first vertical angle  $\phi_L$ , a first vertical angle range of the head position with respect to the left rearview mirror;

detecting a second vertical angle  $\phi_R$ , the second vertical angle being an inclination angle of the right rearview mirror in a vertical direction; and

calculating, on the basis of the second vertical angle  $\phi_R$ , a second vertical angle range of the head position with respect to the right rearview mirror.

23. The method of claim 22, further comprising selecting values for a set of predetermined angles, the predetermined angles consisting of  $\Delta\phi_{L1}$ ,  $\Delta\phi_{L2}$ ,  $\Delta\phi_{R1}$ , and  $\Delta\phi_{R2}$ ,

wherein the first vertical angle range comprises, upward from a horizontal plane of a vehicle body, a range of  $\phi_L + \Delta\phi_{L1}$  to  $\phi_L + \Delta\phi_{L2}$ ; and

the second vertical angle range comprises, upward from the horizontal plane of the vehicle body, a range of  $\phi_R + \Delta\phi_{R1}$  to  $\phi_R + \Delta\phi_{R2}$ .